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PATENT
Atty. Docket: 1400-19 (1083)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : BARKAN et al. Examiner: Larry D. Taylor

Serial No. : 09/880,899 Group Art Unit: 2876

Filed : June 15, 2001

For : OMNIDIRECTIONAL LINEAR SENSOR-BASED CODE READING ENGINES

MAIL STOP RCE
P.O. Box 1450
Commissioner for Patents
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Sir:

In response to an Advisory Action of the U.S. Patent and Trademark Office mailed on July 30, 2003 and a Final Office Action mailed on May 20, 2003, please amend the subject application as follows:

IN THE CLAIMS:

Please amend Claims 1, 2, 11, 13, 21 and 23:

CERTIFICATE OF MAILING UNDER 37 C.F.R. §1.10

I hereby certify that this correspondence is being deposited with the United States Postal Service in an envelope as "Express Mail Post Office to Addressee" Mail Label No. EV272656026US addressed to: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Dated: August 7, 2003

Adrienne Fagan

1. (Currently Amended) An apparatus for an optical code reader comprising:

a first solid state photo sensor array having cells arranged in a line along ~~an axis~~ a plane of the array for producing electronic signals corresponding to an image of at least a portion of a target optical code symbol;

a second solid state photo sensor array having cells arranged in a line along ~~an axis substantially identical to the axis of the first~~ a plane of the second solid state photo sensor array, ~~said axes are oriented at~~ planes extending from the planes of the first and second solid state photo sensor arrays form an intersecting angle with respect to each other, the second sensor array for producing electronic signals corresponding to at least a portion of a target optical code symbol; and

electronic analog to digital converter means for converting electronic signals from at least one of said sensor arrays to bit content of a target optical code symbol to be read.

Cl Cont.

2. (Currently Amended) The apparatus of claim 1 further comprising a third solid state photo sensor array having cells arranged in a line along a plane of the third solid state photo sensor array, said plane of the third solid state photo sensor array forming ~~oriented at~~ an acute angle with respect to ~~the lines of the~~ at least one plane of the first and second sensor arrays.

3. (Original) The apparatus of claims 1 or 2 wherein the photo sensor arrays are formed on separate semiconductor dies.

4. (Original) The apparatus of claims 1 or 2 wherein all the photo sensor arrays are formed on the same semiconductor die.

5. (Original) The apparatus of claim 4 wherein space on the die adjacent to the arrays contains support circuitry for the arrays.

6. (Original) The apparatus of claim 2 wherein the lines of the three photo sensor arrays are oriented at an angle of about 60.degree. with respect to one another.

7. (Original) The apparatus of claim 6 wherein the lines of each of the three photo sensor arrays lies along one side of an equilateral triangle, respectively.

8. (Original) The apparatus of claim 1 wherein the photo sensor arrays are each formed on separate dies and wherein an electronic converter means for each array is a microprocessor formed on the respective dies on which the array is located.

9. (Original) The apparatus of claim 1 further comprising a first lens spaced within 10 mm of the first sensor array and a second lens spaced within 10 mm of the second sensor array.

10. (Original) The apparatus of claim 1 further comprising means for producing at least one aiming beam for providing a reference spot on the target optical code symbol to be read.

11. (Currently Amended) The apparatus of claim ~~11~~ 10 wherein the aiming beam producing means and the sensor arrays are formed on the same semiconductor die.

12. (Original) The apparatus of claim 10 wherein the aiming beam producing means comprises at least two LEDs and associated lenses for producing beams which converge to form a reference spot at a preferred focal distance for reading the target optical code symbol.

13. (Currently Amended) A sensor assembly for an apparatus for reading a target one-dimensional optical code symbol whose principle axis has an arbitrary orientation in a plane generally parallel to an image plane of the sensor assembly comprising:

a first solid state photo sensor array having cells arranged in a generally straight line along ~~an axis~~ a plane for producing an electronic signal corresponding to at least a portion of an image of the code symbol;

a second solid state photo sensor array having cells arranged in a generally straight line along ~~an axis substantially identical to the axis of the first~~ a plane of the second solid state photo sensor array for producing an electronic signal corresponding to at least a portion of an image of the code symbol;

a third solid state photo sensor array having cells arranged in a generally straight line along ~~an axis substantially identical to the axes of the first and second sensor arrays~~ a plane of the third solid state photo sensor array for producing an electronic signal corresponding to at least a portion of an image of the code symbol, wherein ~~the axes of~~

~~the first, second and third sensor arrays~~ planes extending from the planes of the first, second and third solid state photo sensor arrays form ~~are oriented at an~~ intersecting angles with respect to one another;

means for focusing images of the target code symbol on each of the three sensor arrays; and

means for converting to digital form electronic signals from the sensor assembly.

14. (Previously Amended) The sensor assembly of claim 13 further comprising electronic means for selecting data obtained from electronic signals from the sensor array whose line is most closely aligned with the principle axis of the target code symbol.

15. (Original) The assembly of claim 13 wherein the lines of the three sensor arrays are oriented at an angle of about 60.degree. with respect to one another.

16. (Original) The assembly of claim 13 wherein each sensor array is formed on a separate die.

17. (Original) The assembly of claim 13 wherein the three sensor arrays are formed on the same die.

18. (Original) The assembly of claim 17 wherein supporting circuitry is located in the space on the die adjacent the sensor arrays.

19. (Original) The assembly of claim 13 wherein the focusing means includes three lens, each one of which having an optical axis which approximately intersects a mid point of the line of its respective sensor array.

20. (Original) The assembly of claim 19 wherein the three lenses are integrally formed on an optical plate located within 10 mm of the image plane of the sensor array.

21. (Currently Amended) An apparatus for an optical code reader comprising:

at least three one-dimensional solid state sensor elements each having an array of cells, each array located along ~~an axis~~ a plane, wherein the ~~axes are oriented at~~ planes form an intersecting angle with respect to one another;

electronic analog to digital converters associated with each one-dimensional solid state sensor elements for converting electronic signals from the photo sensors to digital form; and

means for selecting a signal from one of the analog to digital converters representative of the data content of a one-dimensional target bar code whose principle axis is sufficiently aligned with the axis of the corresponding array to permit data to be extracted.

22. (Previously Amended) The apparatus of claim 21 wherein data content from more than one of the sensor elements is combined to decode a bar code that is positioned such that only a part of the bar code is readable by each sensor element.

23. (Currently Amended) An optical code reader comprising:

a gun-shaped housing comprising a head portion containing a sensor assembly for reading an optical code located forward of and in the vicinity of an optical axis of a sensor assembly, said sensor assembly including at least two sensor elements each having an array of cells, each array located along ~~an axis~~ a plane, wherein the ~~axes are oriented at~~ planes form an intersecting angle with respect to one another, said housing further comprising a handle portion sloping backwardly and downwardly from the head portion, said handle portion having a trigger for actuating the optical code reader; and

a circuit board generally perpendicular to the optical axis of the sensor assembly extending through the head portion and through at least a portion of the length of the handle portion of the housing for carrying the sensor assembly.

24. (Original) The optical code reader of claim 23 wherein the circuit board carries at least one interface connector located at a lower end of the handle portion of the housing.

25. (Original) The optical code reader of claim 23 wherein the circuit board carries a trigger switch actuated by squeezing the trigger.

26. (Original) The optical code reader of claim 23 wherein a portion of the circuit board located in the head portion of the housing carries electronic illumination devices.

27. (Original) The optical code reader of claim 23 wherein a portion of the circuit board located in the head portion of the housing carries plural, separately packaged solid state sensor arrays.

28. (Original) The optical code reader of claim 23 wherein a portion of the circuit board located in the head portion of the housing carries at least one aiming LED.

29. (Original) The optical code reader of claim 23 wherein a portion of the circuit board located in the head portion of the housing carries at least one indicator LED.

30. (Original) The optical code reader of claim 23 wherein a portion of the circuit board carries an audible signal generator.

31. (Original) The optical code reader of claim 23 wherein a principle plane of the circuit board is located substantially parallel to a plane of the field of view of the code reader, and at an acute angle with respect to the handle portion of the housing.